

REMARKS

Claims 5-19 are pending. The independent claims stand rejected for allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention, because “sub-monolayer islands’ is not clear.” The Applicant traverses.

In the field of semiconductor fabrication, a monolayer is widely understood as a layer of material one atom or molecule thick. See, e.g., <http://en.wikipedia.org/wiki/Monolayer>, copy attached. Similarly, a sub-monolayer island is simply an island within a monolayer, that is, a part of a monolayer which differs in material from other parts of the monolayer. A sub-monolayer island is different from an “ordinary island” in that it is confined to a monolayer, while an island not described as a sub-monolayer island may not be so confined. The applicant points out that in the two prior office actions, the previous examiner did not raise any question about the meaning of “sub-monolayer island,” though the examiner and the applicant may have disagreed as to whether such islands were present in the Oiu reference. Thus, the meaning of “sub-monolayer islands” is clear, and the claims do particularly point out and distinctly claim the subject matter of the invention. Accordingly, we ask the Examiner to withdraw the rejection.

As for whether the claimed sub-monolayer islands are distinct from “ordinary quantum-dot-type islands,” the quantum dot islands described in Sugiyama apparently have “a thickness of several molecular layers” (col. 2, ll. 9-10) and “a height of about 5 nm” (col. 4, l. 5), and none of the layers are described as monolayers, thus the dots would appear to not be sub-monolayer islands. In general, “quantum dot” describes the function of a structure, not the structure itself. Whether an island constitutes a quantum dot and whether an island is a sub-monolayer island are independent considerations.

Applicant : Martin Behringer et al.
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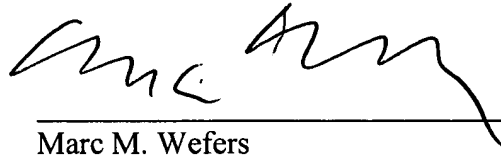
Attorney's Docket No.: 12406-018001 / 1998 P8100 US N

No fees are believed due at this time. Please apply any other charges or credits to deposit account 06-1050, referencing 12406-018001.

Respectfully submitted,

Date: _____

6/5/05



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Monolayer

From Wikipedia, the free encyclopedia

A **monolayer** is a single, closely packed layer of atoms or molecules [1] (<http://www.iupac.org/goldbook/M04015.pdf>). A **Langmuir monolayer** or unsoluble monolayer is a one-molecule thick insoluble layer of an organic material spread onto an aqueous subphase. Traditional compounds used to prepare Langmuir monolayers are amphiphilic materials that possess a hydrophilic headgroup and a hydrophobic tail. Since the 1980s a large number of other materials have been employed to produce Langmuir monolayers, some of which are semi-amphiphilic, including macromolecules such as polymers. Langmuir monolayers are extensively studied for the fabrication of Langmuir-Blodgett film (LB films), which are formed by transferred monolayers on a solid substrate.

A Gibbs monolayer or soluble monolayer is a monolayer formed by a compound that is soluble in one of the phases separated by the interface on which the monolayer is formed.

In biology monolayers are frequently encountered in for instance the phospholipid lipid bilayer structure of biological membranes.

The **monolayer formation time** or **monolayer time** is the length of time required, on average, for a surface to be covered by an adsorbate, such as oxygen sticking to fresh aluminum. If the adsorbate has a unity sticking coefficient, so that every molecule which reaches the surface sticks to it without re-evaporating, then the monolayer time is very roughly:

$$t = 3 \times 10^{-4} / P$$

where t is in seconds and P is the pressure in pascals. It takes about 1 second for a surface to be covered at a pressure of 300 μPa (2×10^{-6} Torr).

Monolayer phases and equations of state

A Langmuir monolayer can be compressed or expanded by modifying its area with a moving barrier in a Langmuir film balance. If the surface tension of the interface is measured during the compression, a *compression isotherm* is obtained. This isotherm shows the variation of surface pressure ($\Pi = \gamma^0 - \gamma$, where γ is the surface tension of the interface before the monolayer is formed) with the area (the inverse of surface concentration Γ^{-1}). It is analogous with a 3D process in which pressure varies with volume.

A variety of bidimensional phases can be detected, each separated by a phase transition. During the phase transition, the surface pressure doesn't change, but the area does, just like during normal phase transitions volume changes but pressure doesn't. The 2D phases, in increasing pressure order:

- Bidimensional gas: there are few molecules per area unit, and they have few interactions, therefore, analogous of the equations of state for 3D gases can be used: ideal gas law $\Pi a_i = RT$, where a_i is the area per molecule as the surface pressure increases, more complex equations are needed (Van der Waals, virial...)
- Expanded liquid
- Compressed liquid
- Solid

If the area is further reduced once the solid phase has been reached, collapse occurs, the monolayer breaks and soluble

aggregates and multilayers are formed

Gibbs monolayers also follow equations of state, which can be deduced from Gibbs isotherm.

- For very dilute solutions $\gamma = \gamma_o - mC$, through Gibbs isotherm another analogous of ideal gas law is reached $\Pi = \Gamma RT$
- For more concentrated solutions and applying Langmuir isotherm $\Gamma = \Gamma_{\max} \frac{C}{a + C}$, thus

$$\Pi = \Gamma_{\max} RT \left(1 + \frac{C}{a} \right)$$

Retrieved from "<http://en.wikipedia.org/wiki/Monolayer>"

Categories: Phases of matter | Thin films | Physical chemistry

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